Creating Value ...

... Delivering Solutions

Chesapeake Bay Protection & Restoration

Improvements and Lessons Learned At Craney Island & Southgate Annex, Norfolk, Virginia

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NAVFAC Naval Facilities Engineering Command

Baker

Report Documentation Page

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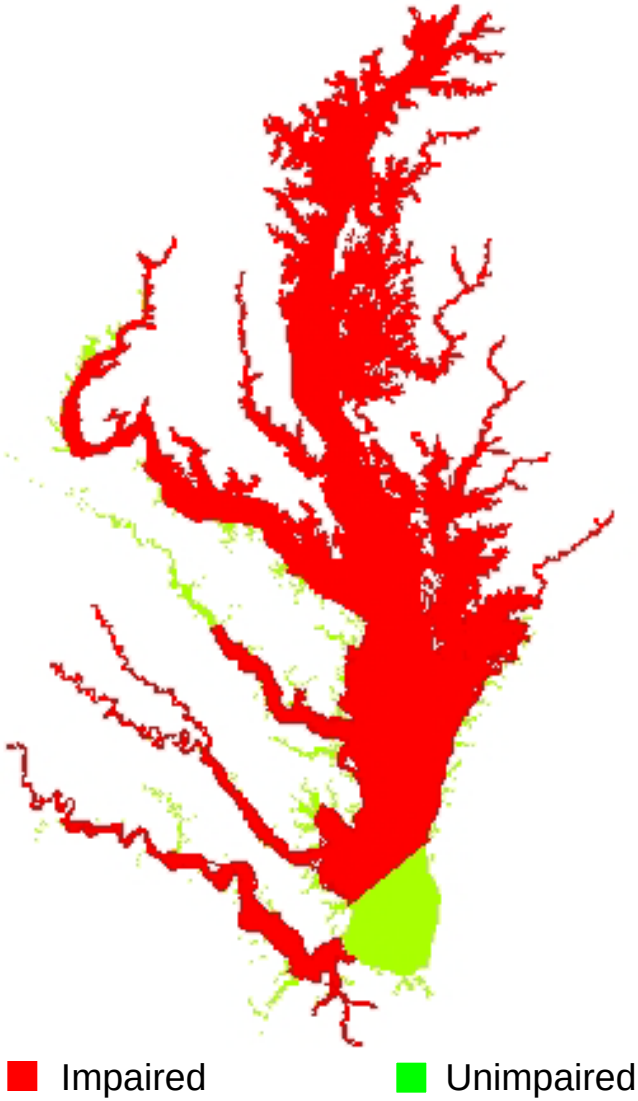
Presentation Overview

- **Study Drivers**
  - Chesapeake Bay Watershed and TMDL
  - Presidential Executive Order 13508
- **Methodology**
- **Results**
- **Highlights of Craney Island and Southgate Annex Case Study**

Bay Impairment

- **Low Dissolved Oxygen**
- **Poor Water Clarity**
- **Too Much Bad Algae**

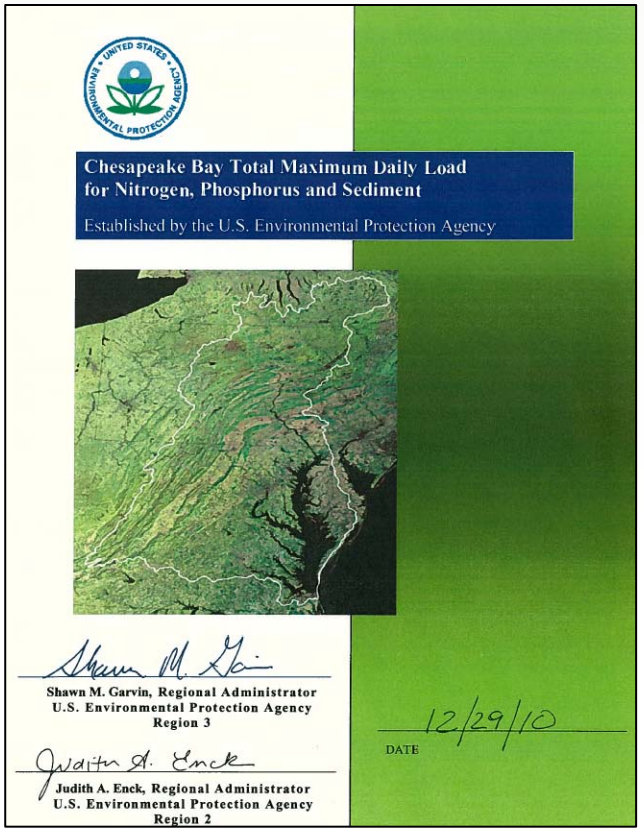
Chesapeake Bay and Tidal Tributary
Nutrient and/or Sediment Impaired Waterbodies



Note: Representation of 303(d) listed waters for nutrient and/or sediment water quality impairments for illustrative purposes only. For exact 303(d) listings , contact EPA (http://www.epa.gov/owow/tmdl/).

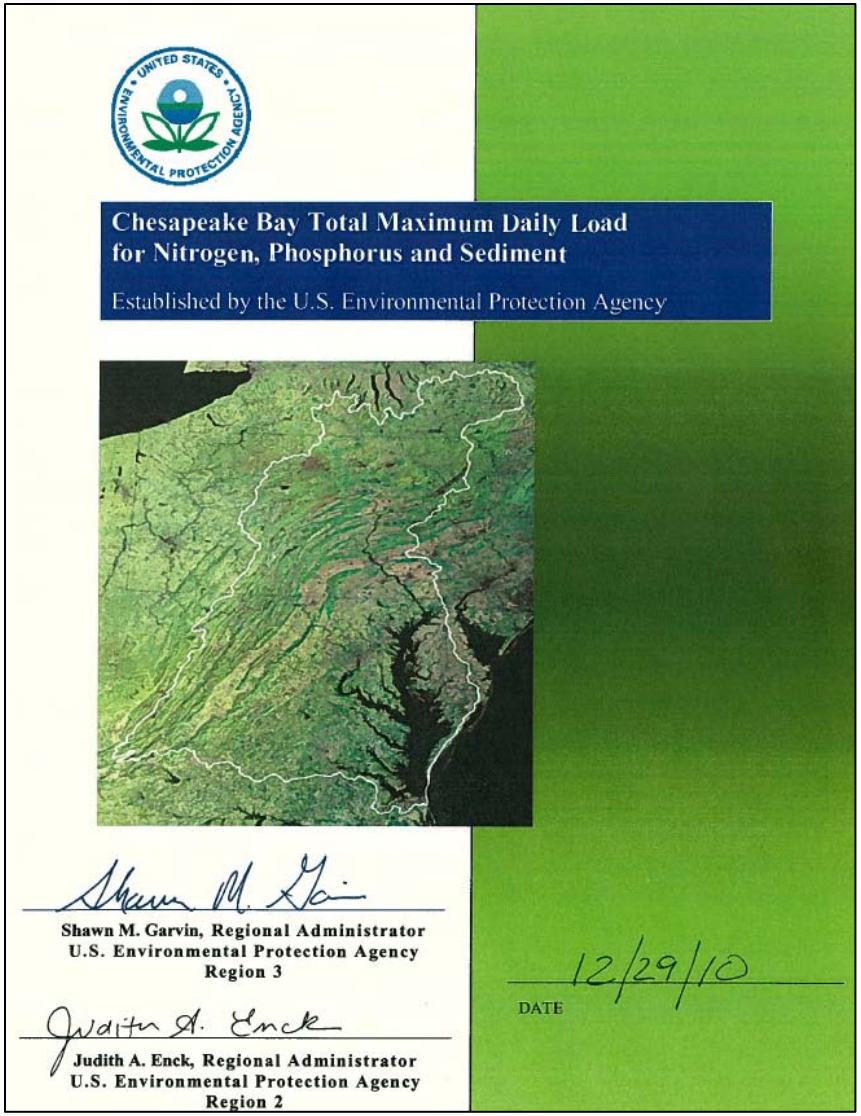
Chesapeake Bay TMDL

- **1999 Lawsuit**
  - EPA commits to bring the Bay and tidal tributaries into compliance with water quality criteria by 2010 or develop a TMDL
    - December 29, 2010 TMDL
- **TMDL or Total Maximum Daily Load is a "pollution diet" that identifies the maximum amount of a pollutant a water body can receive and still meet water quality standards**



Chesapeake Bay TMDL

- **Characterization and estimation of point and nonpoint source loads**
- **Estimation of watershed-scale load reductions**
- **Signed – December 29, 2010**



Watershed Implementation Plans (WIPs)

- **How the states and DC plan to meet the maximum load restrictions imposed by the TMDL with reasonable assurance**

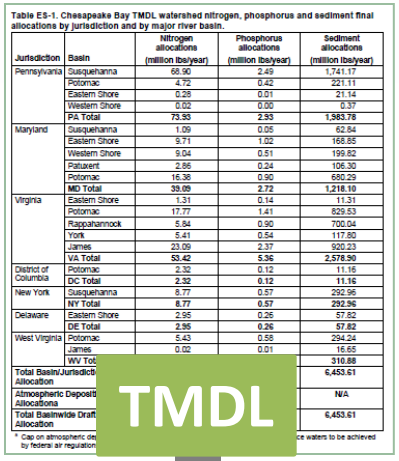


Table ES-1. Chesapeake Bay TMDL watershed nitrogen, phosphorus and sediment final allocations by jurisdiction and by major river basin.

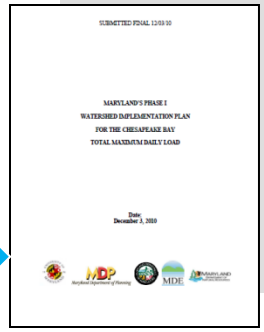
Jurisdiction	Basin	Nitrogen allocations (million lbs/year)	Phosphorus allocations (million lbs/year)	Sediment allocations (million lbs/year)
Pennsylvania	Susquehanna	68.90	2.49	1,741.17
	Potomac	4.72	0.42	221.11
	Eastern Shore	0.28	0.01	21.14
	Western Shore	0.02	0.00	0.37
	PA Total	73.93	2.93	1,983.78
Maryland	Susquehanna	1.09	0.05	62.84
	Eastern Shore	9.71	1.02	168.85
	Western Shore	9.04	0.51	199.82
	Patuxent	2.86	0.24	106.30
	Potomac	16.38	0.90	680.29
	MD Total	39.09	2.72	1,218.10
Virginia	Eastern Shore	1.31	0.14	11.31
	Potomac	17.77	1.41	829.53
	Rappahannock	5.84	0.90	700.04
	York	5.41	0.54	117.80
	James	23.09	2.37	920.23
	VA Total	53.42	5.36	2,578.90
District of Columbia	Potomac	2.32	0.12	11.16
	DC Total	2.32	0.12	11.16
New York	Susquehanna	8.77	0.57	292.96
	NY Total	8.77	0.57	292.96
Delaware	Eastern Shore	2.95	0.26	57.82
	DE Total	2.95	0.26	57.82
West Virginia	Potomac	5.43	0.58	294.24
	James	0.02	0.01	16.65
	WV Tot			310.88
Total Basin/Jurisdicti Allocation				6,453.61
Atmospheric Deposit Allocations				N/A
Total Basinwide Draft Allocation				6,453.61

* Cap on atmospheric de by federal air regulation

ce waters to be achieved

TMDL

State-Basin Allocation



SUBMITTED FINAL 12/03/10

MARYLAND'S PHASE I
WATERSHED IMPLEMENTATION PLAN
FOR THE CHESAPEAKE BAY
TOTAL MAXIMUM DAILY LOAD

Date:
December 3, 2010

WIPs

Phase 1 WIP - 2010

Phase 2 WIP - 2011

Phase 3 WIP - 2017

Source Sector-Local Jurisdiction Allocation

- Wastewater
- Urban Runoff/MS4
- Agriculture
- Forest
- Septic Systems

State Basin Allocation: Example=Virginia

N P Sediment

Table ES-1. Chesapeake Bay TMDL watershed nitrogen, phosphorus and sediment final allocations by jurisdiction and by major river basin.

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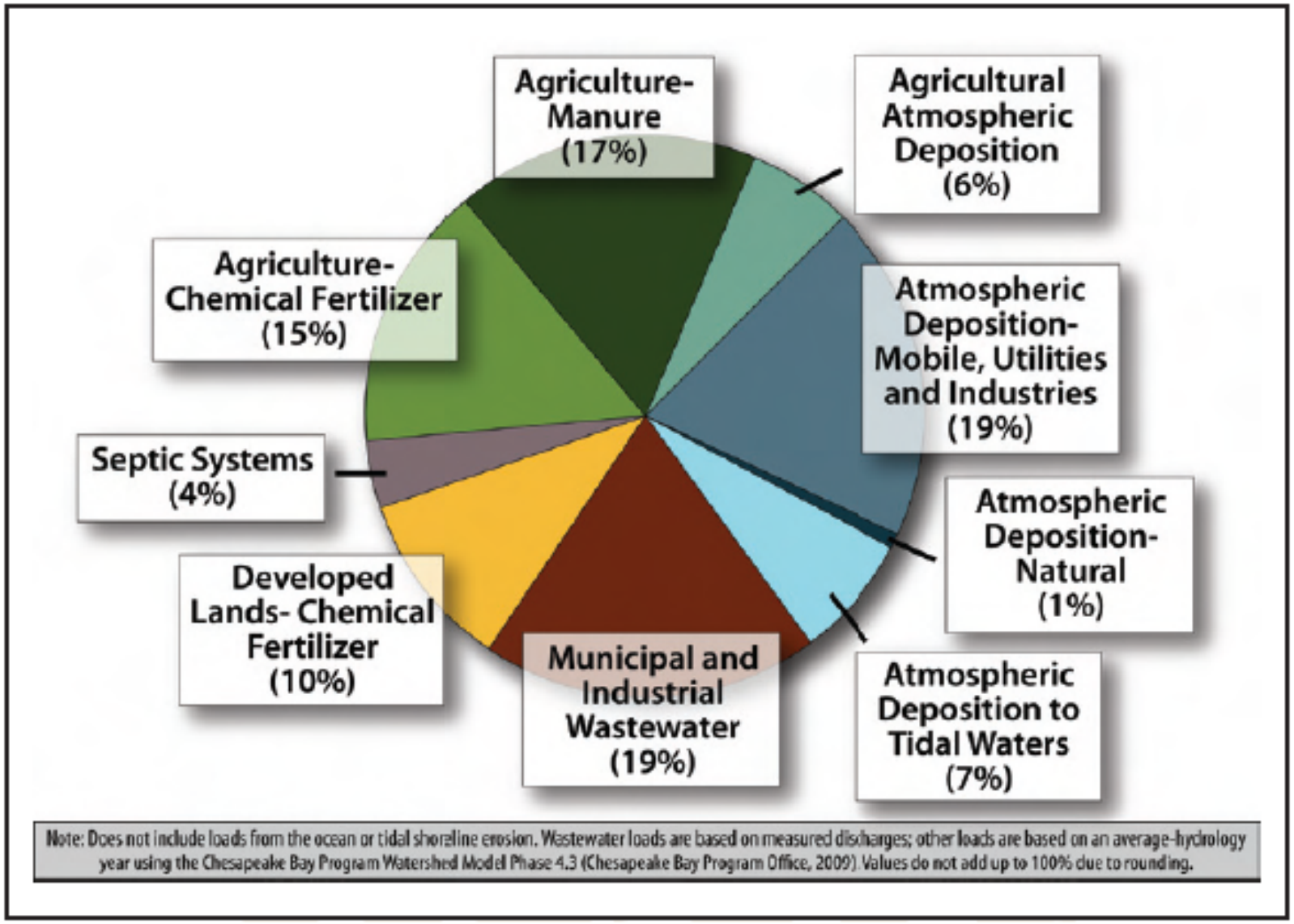
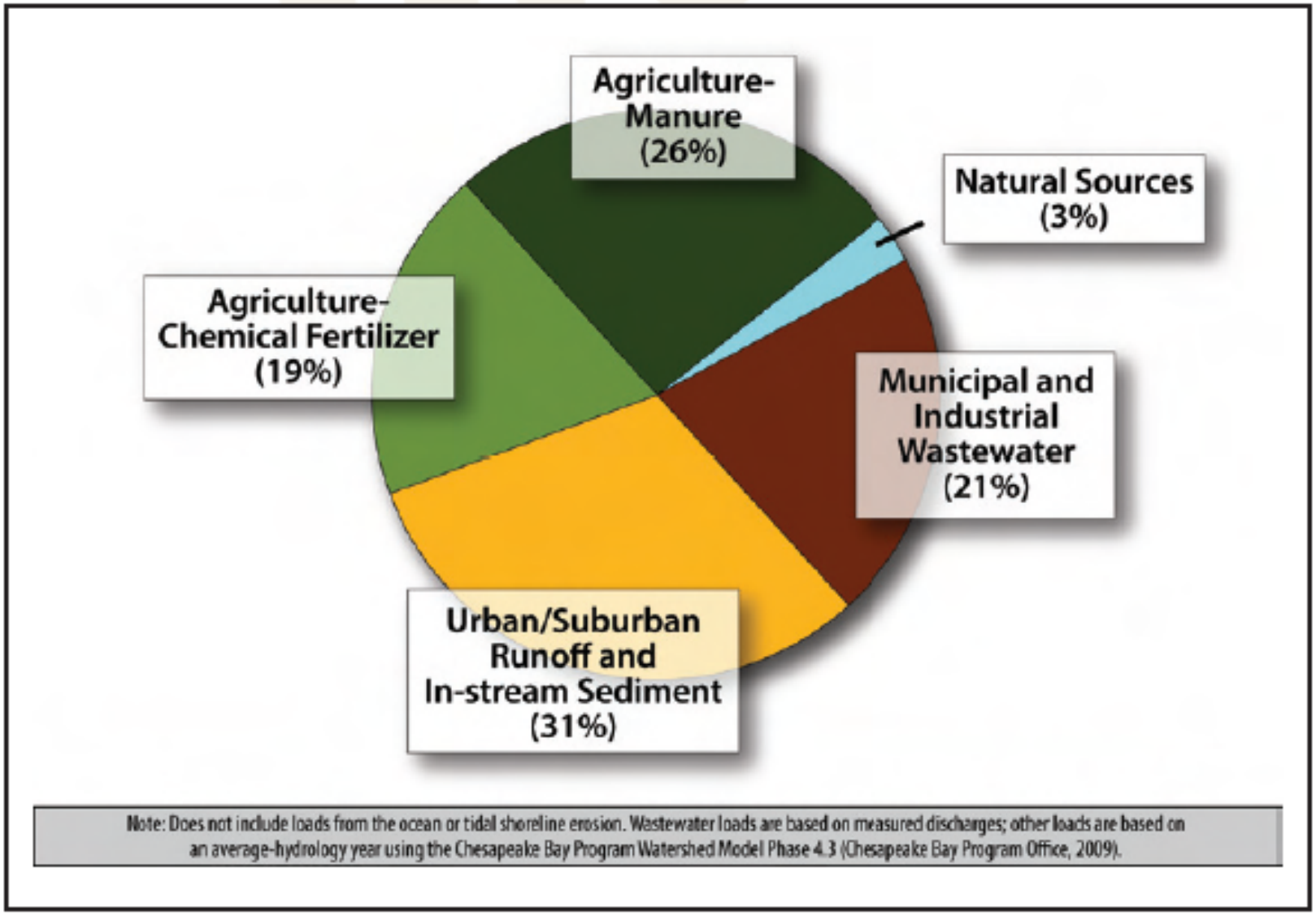
	Potomac	17.77	1.41	829.53
	Rappahannock	5.84	0.90	700.04
	York	5.41	0.54	117.80
	James	23.09	2.37	920.23
	VA Total	**53.42**	**5.36**	**2,578.90**

Nitrogen Loading by Source Sector



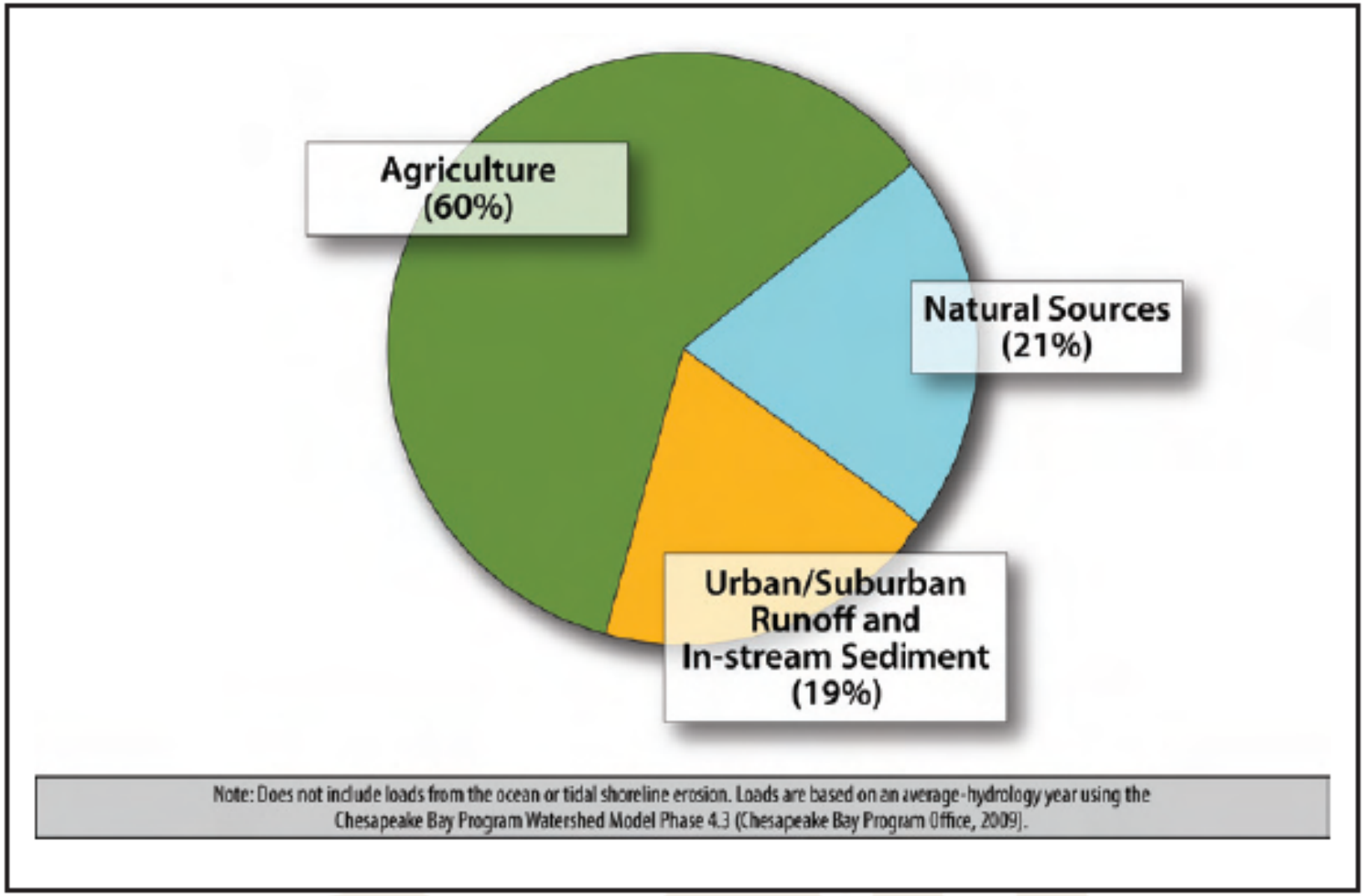
EO 13508 Draft Strategy for Protection and Restoring the Cheapeake Bay

Phosphorus Loading by Source Sector



EO 13508 Draft Strategy for Protection and Restoring the Cheapeake Bay

Sediment Loading by Source Sector



EO 13508 Draft Strategy for Protection and Restoring the Cheapeake Bay

Required Percent Reduction for Urban Sources

Table 8-3. Percent reductions in edge-of-stream loads to achieve urban stormwater WLAs

Jurisdiction	Per-acre edge-of-stream % changes in urban stormwater load from a 2009 baseline*		
	Nitrogen	Phosphorus	Sediment
District of Columbia	6.6%	29.6%	29.6%
Delaware	14.3%	18.3%	23.7%
Maryland**	16.9%	35.7%	37.5%
New York	11.4%	0.0%	0.0%
Pennsylvania	28.9%	17.7%	7.0%
Virginia	16.4%	20.8%	32.5%
West Virginia	0%	0%	0%

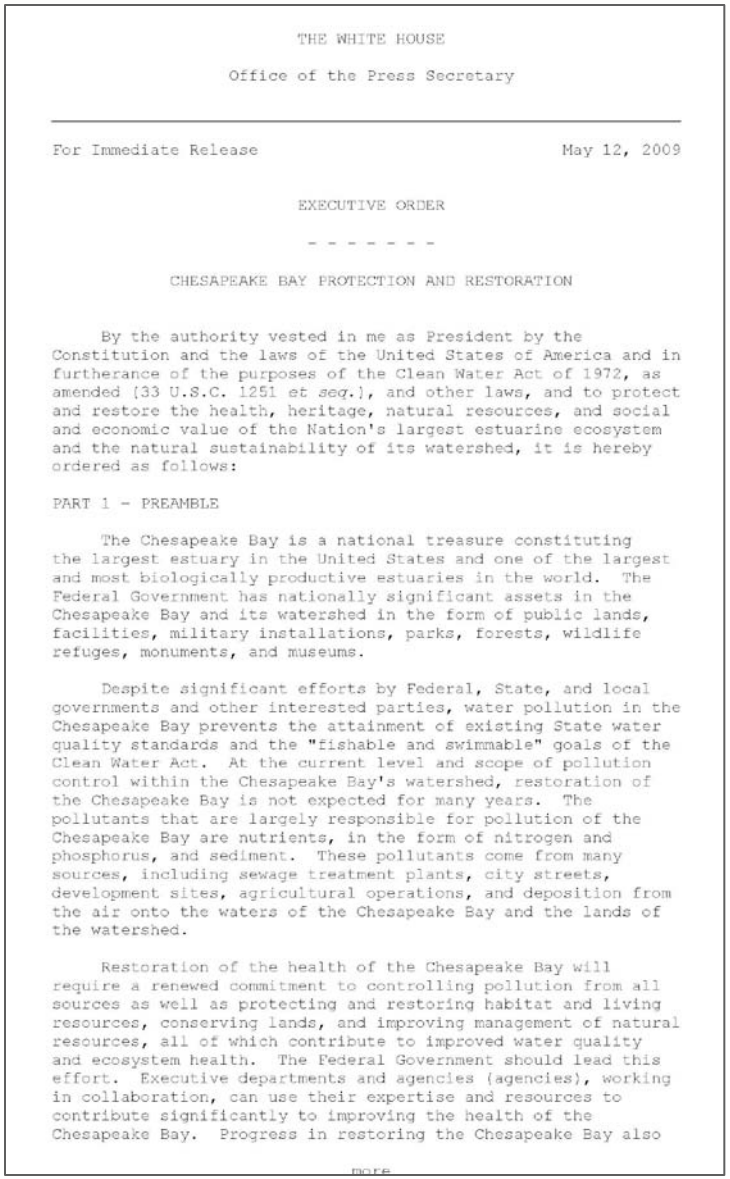
* Edge-of-stream reductions assumed within the urban stormwater WLAs result from differences in BMP implementation rates between 2009 and the final WIP submission.

** Maryland's assumed reductions are calculated as the difference between 2009 edge-of-stream loads and Maryland's final edge-of-stream target loads for urban stormwater WLAs. Maryland derived its final loads using the method outlined in Appendix A of Maryland's WIP.

Chesapeake Bay TMDL, Section 8, 12/29/2010

Executive Order 13508 - "Chesapeake Bay Protection and Restoration"

- **Federal Government is one of the largest land owners**
- **Signed by President Barack Obama on May 12, 2009**



THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release May 12, 2009

EXECUTIVE ORDER

- - - - - - - -

CHESAPEAKE BAY PROTECTION AND RESTORATION

By the authority vested in me as President by the Constitution and the laws of the United States of America and in furtherance of the purposes of the Clean Water Act of 1972, as amended [33 U.S.C. 1251 *et seq.*], and other laws, and to protect and restore the health, heritage, natural resources, and social and economic value of the Nation's largest estuarine ecosystem and the natural sustainability of its watershed, it is hereby ordered as follows:

PART 1 - PREAMBLE

The Chesapeake Bay is a national treasure constituting the largest estuary in the United States and one of the largest and most biologically productive estuaries in the world. The Federal Government has nationally significant assets in the Chesapeake Bay and its watershed in the form of public lands, facilities, military installations, parks, forests, wildlife refuges, monuments, and museums.

Despite significant efforts by Federal, State, and local governments and other interested parties, water pollution in the Chesapeake Bay prevents the attainment of existing State water quality standards and the "fishable and swimmable" goals of the Clean Water Act. At the current level and scope of pollution control within the Chesapeake Bay's watershed, restoration of the Chesapeake Bay is not expected for many years. The pollutants that are largely responsible for pollution of the Chesapeake Bay are nutrients, in the form of nitrogen and phosphorus, and sediment. These pollutants come from many sources, including sewage treatment plants, city streets, development sites, agricultural operations, and deposition from the air onto the waters of the Chesapeake Bay and the lands of the watershed.

Restoration of the health of the Chesapeake Bay will require a renewed commitment to controlling pollution from all sources as well as protecting and restoring habitat and living resources, conserving lands, and improving management of natural resources, all of which contribute to improved water quality and ecosystem health. The Federal Government should lead this effort. Executive departments and agencies (agencies), working in collaboration, can use their expertise and resources to contribute significantly to improving the health of the Chesapeake Bay. Progress in restoring the Chesapeake Bay also

more

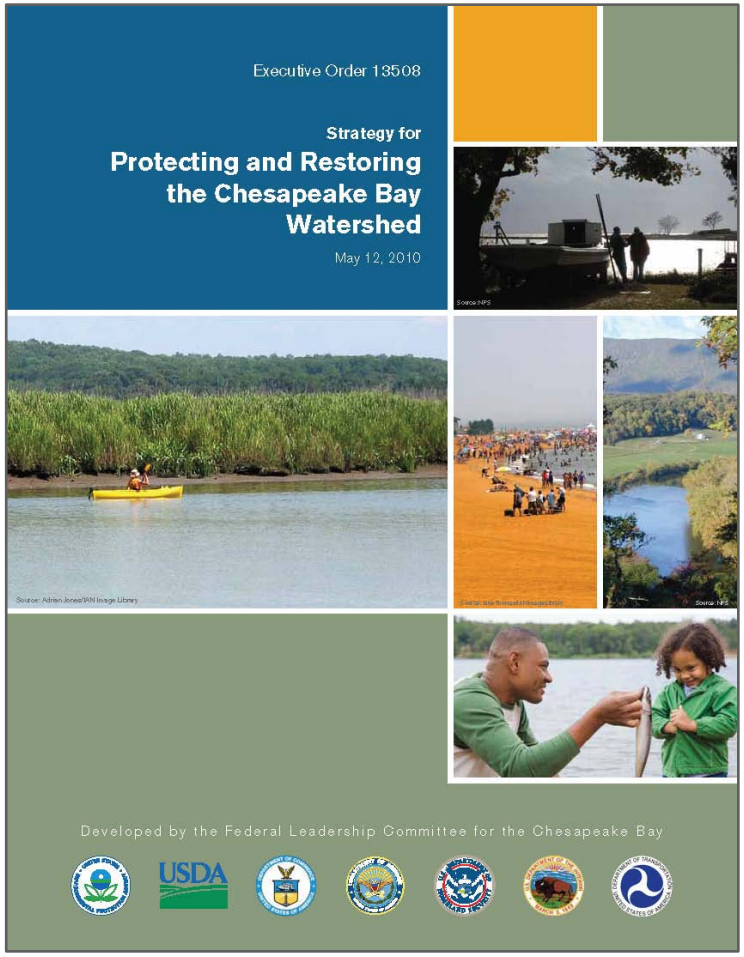
Executive Order 13508 - "Chesapeake Bay Protection and Restoration

- **Department of Defense (DoD) is lead on stormwater management practices for Federal facilities (EPA was lead on stormwater guidance documents)**
- **Dept of Navy (DON) is lead agency for DoD's Chesapeake Bay Restoration effort**

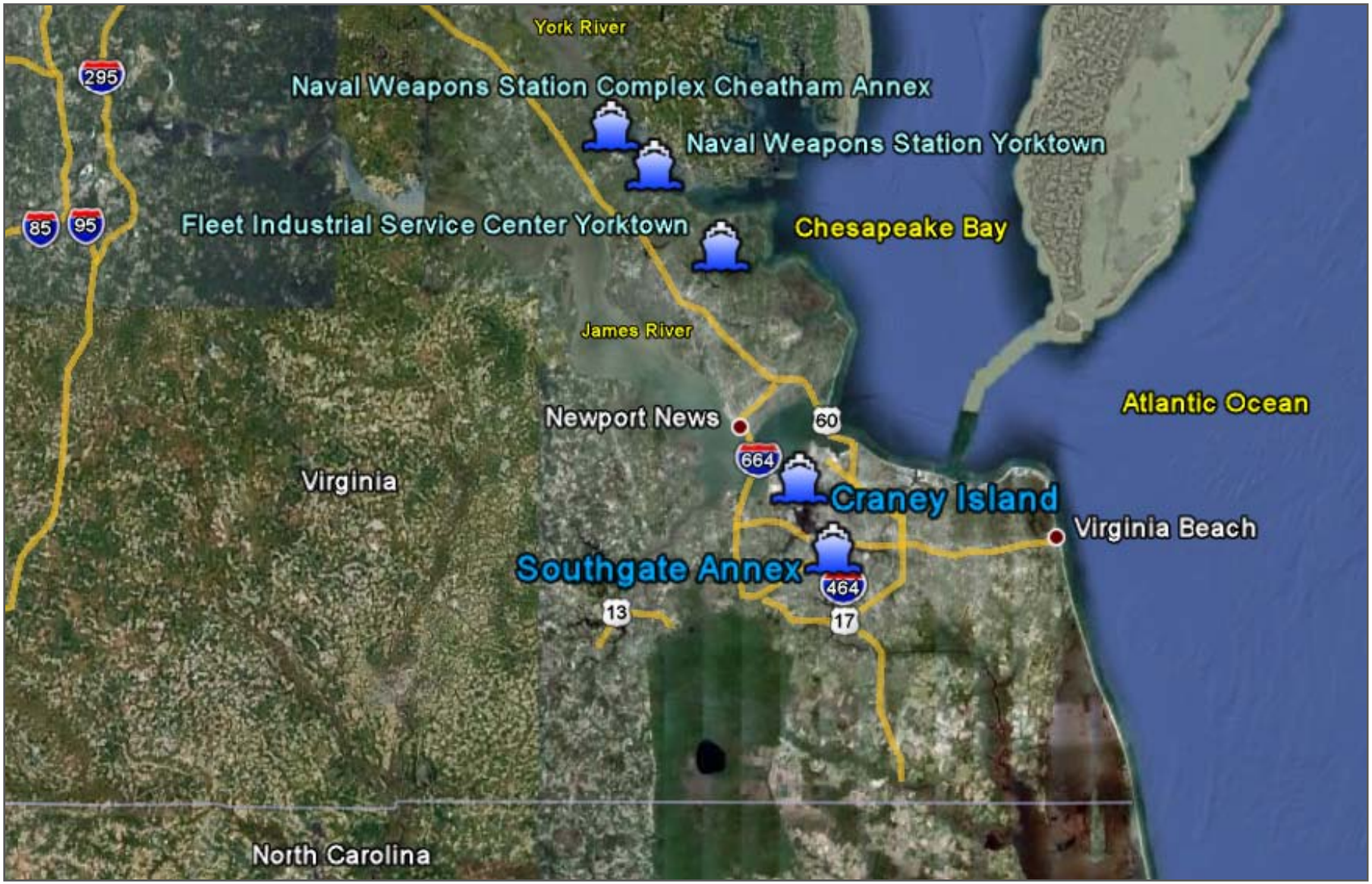
Photo Credit: NASA

EO 13508 Strategy Document

- Assess properties to determine feasibility of urban retrofit practices
- Align cost-effective urban stormwater retrofits and erosion repairs with TMDL goals
- Assess and implement non-structural BMPs to control runoff from developed areas
- Consider full spectrum of nutrient and sediment sources to assess ideal reduction methods



Navy Projects Completed or Underway



Craney Island & Southgate Annex

Purpose: ***Provide implementation "road map" that identifies Stormwater Management (SM), Erosion Control (EC) and Infrastructure (INF) opportunities and ranks SM's and EC's***

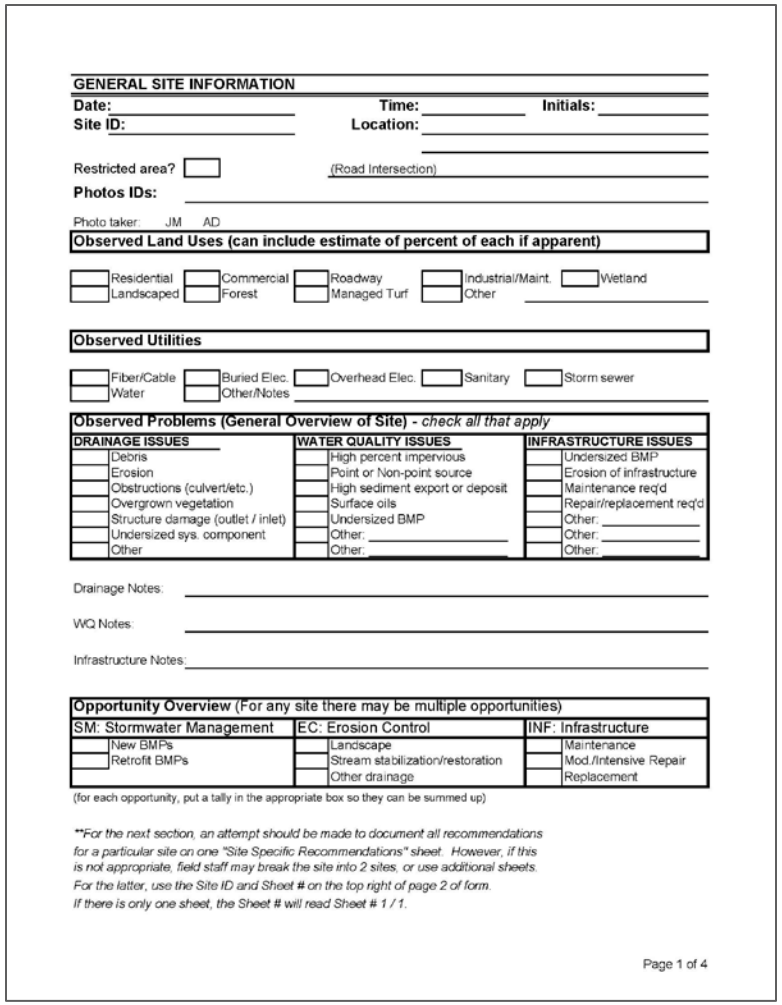
Southgate Annex on the South Branch of the Elizabeth River Portsmouth, VA

Craney Island near the mouth of the Elizabeth and James Rivers

Craney Island & Southgate Annex

1. *Pre-Assessment Planning, Site Assessment Strategy*

- **Existing Data Sources Evaluated**
  - CAD, GIS, Aerials
- **Assessment Form Developed**
  - Based on Prioritization Criteria/Detail Required for Concept Design
  - Database Framework Known



GENERAL SITE INFORMATION

Date: **Time:** **Initials:**
Site ID: **Location:**

Restricted area? ☐ (Road Intersection)
Photos IDs:

Photo taker: JM AD

Observed Land Uses (can include estimate of percent of each if apparent)

☐ Residential ☐ Commercial ☐ Roadway ☐ Industrial/Maint. ☐ Wetland
☐ Landscaped ☐ Forest ☐ Managed Turf ☐ Other

Observed Utilities

☐ Fiber/Cable ☐ Buried Elec. ☐ Overhead Elec. ☐ Sanitary ☐ Storm sewer
☐ Water ☐ Other/Notes

Observed Problems (General Overview of Site) - *check all that apply*

DRAINAGE ISSUES	WATER QUALITY ISSUES	INFRASTRUCTURE ISSUES
☐ Debris	☐ High percent impervious	☐ Undersized BMP
☐ Erosion	☐ Point or Non-point source	☐ Erosion of infrastructure
☐ Obstructions (culvert/etc.)	☐ High sediment export or deposit	☐ Maintenance req'd
☐ Overgrown vegetation	☐ Surface oils	☐ Repair/replacement req'd
☐ Structure damage (outlet / inlet)	☐ Undersized BMP	☐ Other:
☐ Undersized sys. component	☐ Other:	☐ Other:
☐ Other	☐ Other:	☐ Other:

Drainage Notes:

WQ Notes:

Infrastructure Notes:

Opportunity Overview (For any site there may be multiple opportunities)

SM: Stormwater Management	EC: Erosion Control	INF: Infrastructure
☐ New BMPs	☐ Landscape	☐ Maintenance
☐ Retrofit BMPs	☐ Stream stabilization/restoration	☐ Mod./Intensive Repair
	☐ Other drainage	☐ Replacement

(for each opportunity, put a tally in the appropriate box so they can be summed up)

***For the next section, an attempt should be made to document all recommendations for a particular site on one "Site Specific Recommendations" sheet. However, if this is not appropriate, field staff may break the site into 2 sites, or use additional sheets. For the latter, use the Site ID and Sheet # on the top right of page 2 of form. If there is only one sheet, the Sheet # will read Sheet # 1 / 1.*

Page 1 of 4

Craney Island & Southgate Annex

1. *Pre-Assessment Planning, Site Assessment Strategy*

- **Opportunity Scoring**
  - **Scoring System for Stormwater Management**
    - Category 1: Environmental Improvement Factors
    - Category 2: Benefits
    - Category 3: Constraints
    - Category 4: Relative BMP Cost Factors
  - **Scoring System for Erosion Control**
    - Location, Extent, Impact, Access, Design
  - **No Scoring for Infrastructure**

Case Study: Craney Island & Southgate Annex

1. *Pre-Assessment Planning, Site Assessment Strategy*

- **Field Preparation**

Print off large maps
Pocket Rod
100' Tape
Tape
Hand Level
Field metal box
Field book
Driver's Lic
Passport (or Birth Cert.)
I-9 Form
Soil auger
2nd camera w/ both cards and charger
Camera chord
Lighter power converter
Geolink
Thumb drive with important files
Baker hat
Itinerary
Computer

NAVFAC Naval Facilities Engineering Command

Baker

Identify Opportunities to Strengthen Storm Water Management to Comply with EO 13508 –

Chesapeake Bay Protection and Restoration

at Craney Island, Southgate Annex

N62470-10-D-3000; DO WE19

Michael Baker Jr., Inc.

Maps for Field Work Week of November 1, 2010

Contacts:

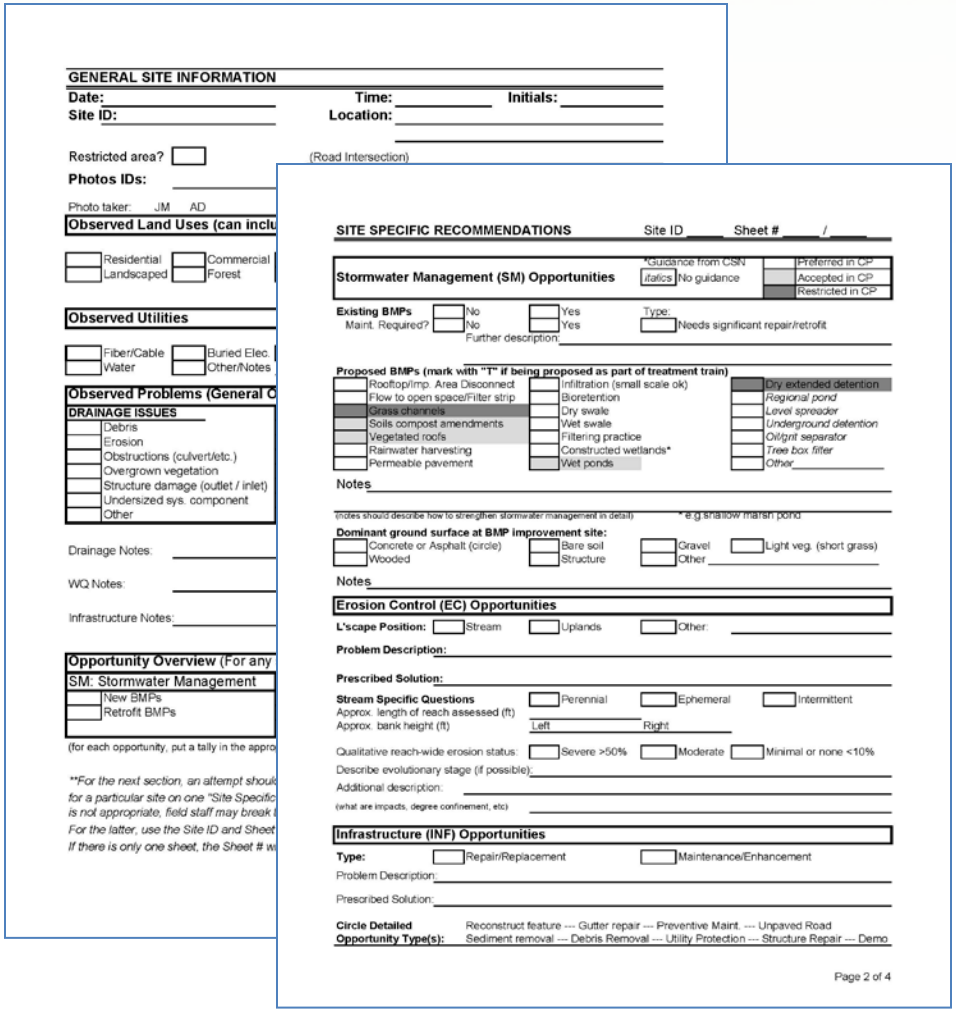
Abbi Dorn, PE 770-861-8539

Jake McClean, PE 828-545-3865

Case Study: Craney Island & Southgate Annex

2. Field *Assessment*

Site information



GENERAL SITE INFORMATION

Date: Time: Initials:

Site ID: Location:

Restricted area?

Photos IDs:

Photo taker: JM AD

Observed Land Uses (can inclu

Residential Commercial
Landscaped Forest

Observed Utilities

Fiber/Cable Buried Elec.
Water Other/Notes

Observed Problems (General C

DRAINAGE ISSUES

Debris
Erosion
Obstructions (culvert/etc.)
Overgrown vegetation
Structure damage (outlet / inlet)
Undersized sys. component
Other

Drainage Notes:

WQ Notes:

Infrastructure Notes:

Opportunity Overview (For any

SM: Stormwater Management

New BMPs
Retrofit BMPs

(for each opportunity, put a tally in the appro

**For the next section, an attempt shoul
for a particular site on one "Site Specific
is not appropriate, field staff may break
For the latter, use the Site ID and Sheet
If there is only one sheet, the Sheet # w

(Road Intersection)

SITE SPECIFIC RECOMMENDATIONS Site ID Sheet # /

Stormwater Management (SM) Opportunities

Guidance from CSN: *Italics* No guidance

Preferred in CP
Accepted in CP
Restricted in CP

Existing BMPs
Maint. Required? No No Yes Yes Type:
Needs significant repair/retrofit
Further description:

Proposed BMPs (mark with "T" if being proposed as part of treatment train)

Rooftop/Imp. Area Disconnect
Flow to open space/Filter strip
Grass channels
Soils compost amendments
Vegetated roofs
Rainwater harvesting
Permeable pavement
Infiltration (small scale ok)
Bioretention
Dry swale
Wet swale
Filtering practice
Constructed wetlands*
Wet ponds
Dry extended detention
Regional pond
Level spreader
Underground detention
Oil/grit separator
Tree box filter
Other

Notes

(notes should describe how to strengthen stormwater management in detail) * e.g.shallow marsh pond

Dominant ground surface at BMP improvement site:

Concrete or Asphalt (circle)
Wooded
Bare soil
Structure
Gravel
Other
Light veg. (short grass)

Notes

Erosion Control (EC) Opportunities

L'scape Position: Stream Uplands Other:

Problem Description:

Prescribed Solution:

Stream Specific Questions
Approx. length of reach assessed (ft)
Approx. bank height (ft) Left Right
Perennial Ephemeral Intermittent

Qualitative reach-wide erosion status: Severe >50% Moderate Minimal or none <10%

Describe evolutionary stage (if possible):

Additional description:

(what are impacts, degree confinement, etc)

Infrastructure (INF) Opportunities

Type: Repair/Replacement Maintenance/Enhancement

Problem Description:

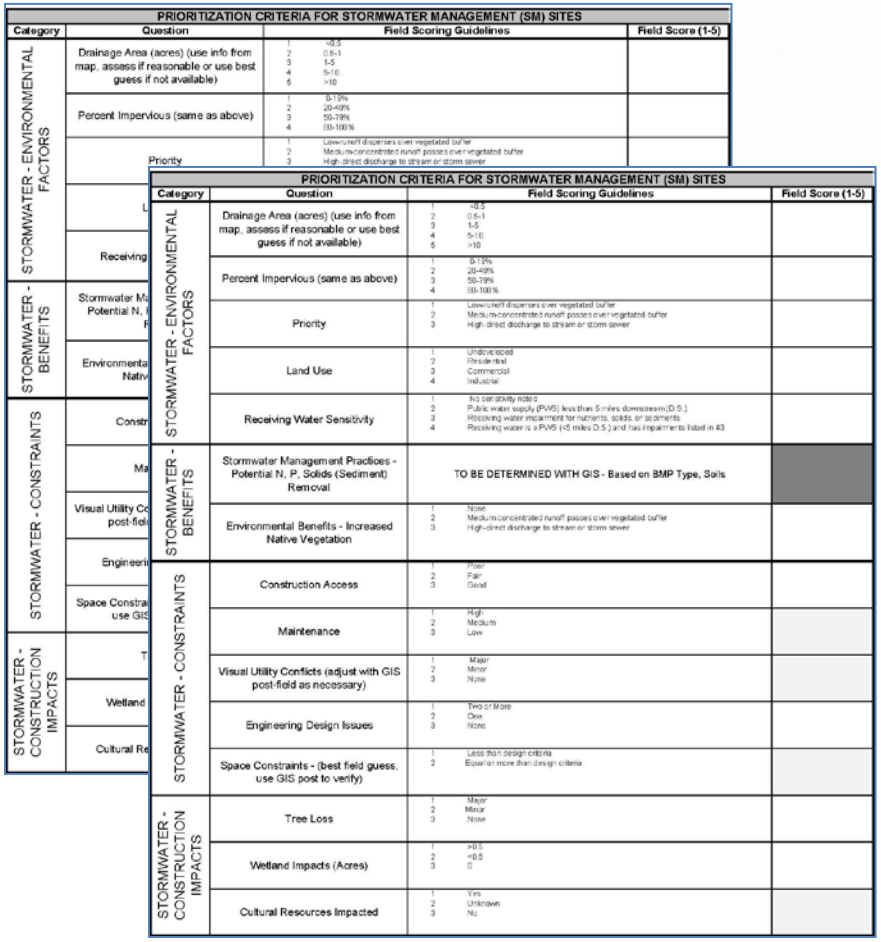
Prescribed Solution:

Circle Detailed Opportunity Type(s): Reconstruct feature --- Gutter repair --- Preventive Maint. --- Unpaved Road Sediment removal --- Debris Removal --- Utility Protection --- Structure Repair --- Demo

Page 2 of 4

Opportunity information

Scoring/Ranking (SM)



PRIORITIZATION CRITERIA FOR STORMWATER MANAGEMENT (SM) SITES

Category	Question	Field Scoring Guidelines	Field Score (1-5)
STORMWATER - ENVIRONMENTAL FACTORS	Drainage Area (acres) (use info from map, assess if reasonable or use best guess if not available)	1 <0.5 2 0.5-1 3 1-5 4 5-10 5 >10	
	Percent Impervious (same as above)	1 0-19% 2 20-49% 3 50-79% 4 80-100%	
	Priority	1 Low-runoff dispersed over vegetated buffer 2 Medium-concentrated runoff passes over vegetated buffer 3 High-direct discharge to stream or storm sewer	
	Land Use	1 Undeveloped 2 Residential 3 Commercial 4 Industrial	
STORMWATER - BENEFITS	Receiving Water Sensitivity	1 No sensitivity noted 2 Public water supply (PWS) less than 5 miles downstream (D.S.) 3 Receiving water impairment for nutrients, solids, or sediments 4 Receiving water is a PWS (<5 miles D.S.) and has impairments listed in #3	
	Stormwater Management Practices - Potential N, P, Solids (Sediment) Removal	TO BE DETERMINED WITH GIS - Based on BMP Type, Soils	
	Environmental Benefits - Increased Native Vegetation	1 None 2 Medium-concentrated runoff passes over vegetated buffer 3 High-direct discharge to stream or storm sewer	
STORMWATER - CONSTRAINTS	Construction Access	1 Poor 2 Fair 3 Good	
	Maintenance	1 High 2 Medium 3 Low	
	Visual Utility Conflicts (adjust with GIS post-field as necessary)	1 Major 2 Minor 3 None	
	Engineering Design Issues	1 Two or More 2 One 3 None	
	Space Constraints - (best field guess, use GIS post to verify)	1 Less than design criteria 2 Equal or more than design criteria	
STORMWATER - CONSTRUCTION IMPACTS	Tree Loss	1 Major 2 Minor 3 None	
	Wetland Impacts (Acres)	1 >0.5 2 <0.5 3 0	
	Cultural Resources Impacted	1 Yes 2 Unknown 3 No	

Ranking (EC)

***No Ranking for Infrastructure (INF)**

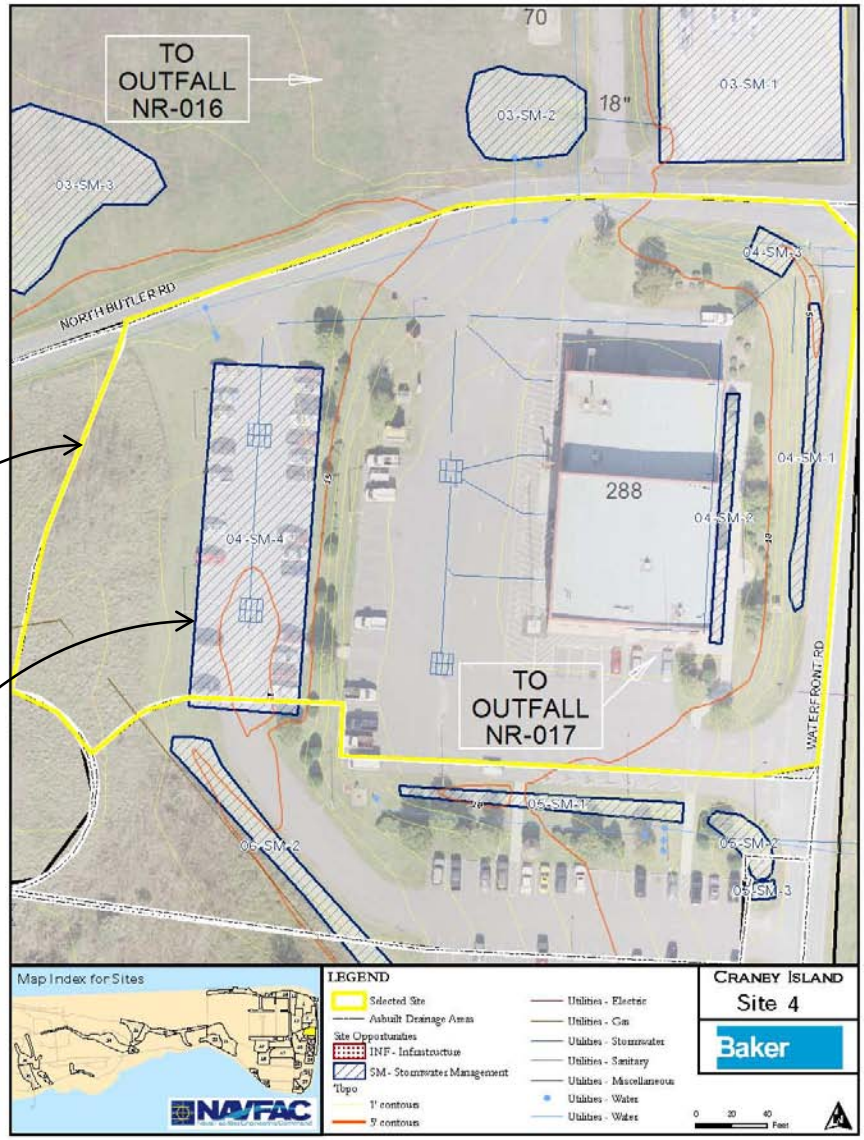
Case Study: Craney Island & Southgate Annex

2. Field *Assessment, Site Specific Information*

- **Date, Site ID, Time, Location…**
- **Observed Land Uses**
- **Observed Utilities**
- **Observed Problems**

“Site”

“Opportunity”
(multiple within a site)



Case Study: Craney Island & Southgate Annex

2. Field *Assessment, Opportunity Specific Information*

OPPORTUNITY OVERVIEW

Stormwater Management (SM) | Erosion Control (EC) | Infrastructure (INF)

Stormwater Management (SM) Opportunities:		
Proposed BMPs:		
Rooftop/Imp. Area Disconnect	Infiltration	Dry Extended Detention
Flow to open space/filter strip	Bioretention	Regional pond
Grass Channels	Dry swale	Level spreader
Soils compost amendments	Wet swale	Underground detention
Vegetated Roofs	Filtering practice	Oil/grit separator
Rainwater harvesting	Constructed wetlands	Tree box filter
Permeable pavement	Wet ponds	Other: _____
Existing BMPs: Yes/No		
Maintenance Required: Yes/No		

Erosion Control (EC) Opportunities:		
Landscape Position:		
Stream	Uplands	Other: _____
Stream Specific Questions:		
Perennial	Ephemeral	Intermittent
Qualitative Reach Wide Erosion Status:		
Severe > 50%	Moderate	Minimal or None (<10%)
Problem Description: _____		
Prescribed Solution: _____		

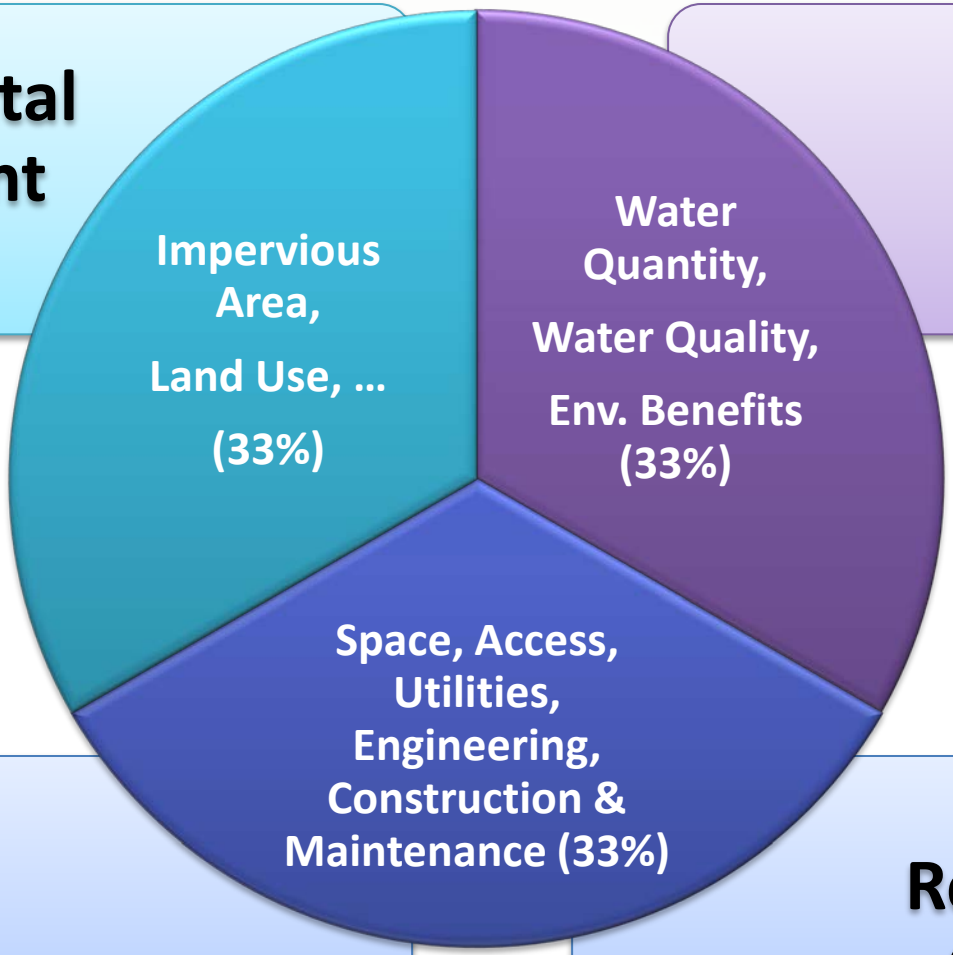
Infrastructure (INF) Opportunities:		
Type:		
Repair/Replacement	Maintenance/Enhancement	
Opportunity Type:		
Reconstruct feature	Gutter repair	Preventative maintenance
Unpaved road	Sediment removal	Debris removal
Utility protection	Structure repair	Demo
Problem Description: _____		

Case Study: Craney Island & Southgate Annex

2. Field *Assessment* *Ranking Categories*

Environmental Improvement Factors

Benefits



Constraints

Relative BMP Cost Factors

Case Study: Craney Island & Southgate Annex

Category	Scoring Elements	Maximum Element Score	Maximum Category Score
Environmental Improvement Factors	Contributing Impervious Drainage Area	25	50 (33%)
	Stormwater Benefits from Existing Landscape	10	
	Land Use	10	
	Receiving Water Sensitivity	5	
Benefits	Potential Nitrogen, Phosphorous, and Solids Removal	20	50 (33%)
	Runoff Reduction	20	
	Environmental Benefits	5	
	Tree and Vegetation Loss Minimization	5	
Constraints	Space Constraints	5	30 (20%)
	Construction Access	5	
	Utility Conflicts	10	
	Engineering Design Issues	10	
Relative BMP Cost Factors	Unit Construction Cost	10	20 (13%)
	Maintenance Burden/Cost	10	
		Total Maximum Possible Score:	**150**
Fatal Flaws - Considerations that may preclude certain opportunities from being viable, as described at the beginning of Appendix A			F

Case Study: Craney Island & Southgate Annex

3. Data Development

- **Wrestling with the data...**

Southgate Annex
SA

GENERAL SITE INFORMATION

Date: 11/1/10 Time: 145 Initials: JM/A
Site ID: 1 Location: PKG LOT - SOUTH (SHT B01)

Restricted area? ☐ (Road Intersection)
Photos IDs: 1-6,
Photo taker: JM AD

Observed Land Uses (can include estimate of percent of each if apparent)

☐ Residential ☐ Landscaped ☐ Commercial ☐ Forest ☐ Roadway ☐ Managed Turf ☐ Industrial/Maint. ☒ Other PKG LOT ☐ Wetland

Observed Utilities

☐ Fiber/Cable ☒ Water ☒ Buried Elec. ☒ Overhead Elec. ☒ Sanitary ☒ Storm sewer ☐ Other/Notes

Observed Problems (General Overview of Site) - *check all that apply*

DRAINAGE ISSUES	WATER QUALITY ISSUES	INFRASTRUCTURE ISSUES
☐ Debris	☒ High percent impervious	☐ Undersized BMP
☐ Erosion	☒ Point or Non-point source	☒ Erosion of infrastructure
☐ Obstructions (culvert/etc.)	☐ High sediment export or deposit	☐ Maintenance req'd
☐ Overgrown vegetation	☐ Surface oils	☐ Repair/replacement req'd
☐ Structure damage (outlet / inlet)	☐ Undersized BMP	☐ Other:
☐ Undersized sys. component	☐ Other:	☐ Other:
☐ Other	☐ Other:	☐ Other:

Drainage Notes:

WQ Notes: Vehicle (long term vehicle storage?), not in active use at time of assessment

Infrastructure Notes: Sinkhole (minor), however, additional noted downgradient in Site 2 area

Opportunity Overview (For any site there may be multiple opportunities)

SM: Stormwater Management	EC: Erosion Control	INF: Infrastructure
☒ New BMPs	☐ Landscape	☒ Maintenance I2
☐ Retrofit BMPs	☐ Stream stabilization/restoration	☒ Mod./Intensive Repair I1
	☐ Other drainage	☐ Replacement

(for each opportunity, put a tally in the appropriate box so they can be summed up)

***For the next section, an attempt should be made to document all recommendations for a particular site on one "Site Specific Recommendations" sheet. However, if this*

Spatial data

Attribute data

Photos

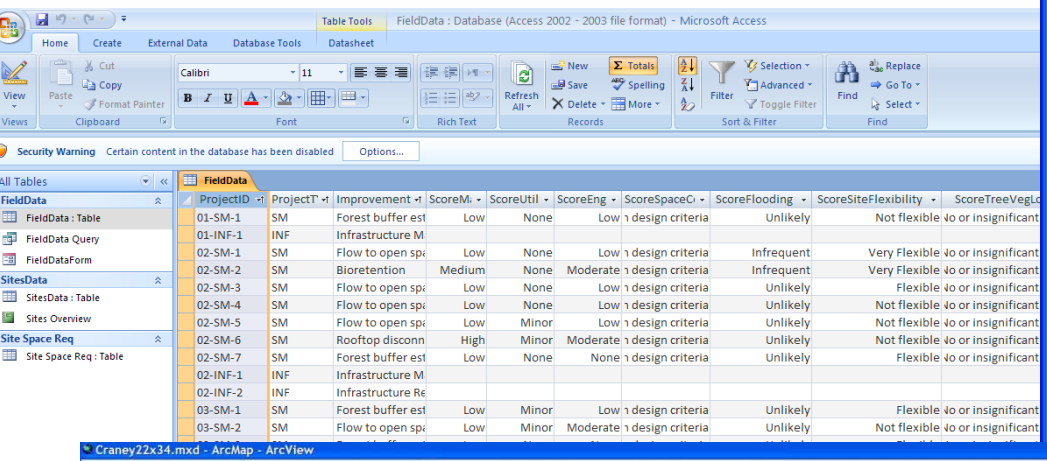
Case Study: Craney Island & Southgate Annex

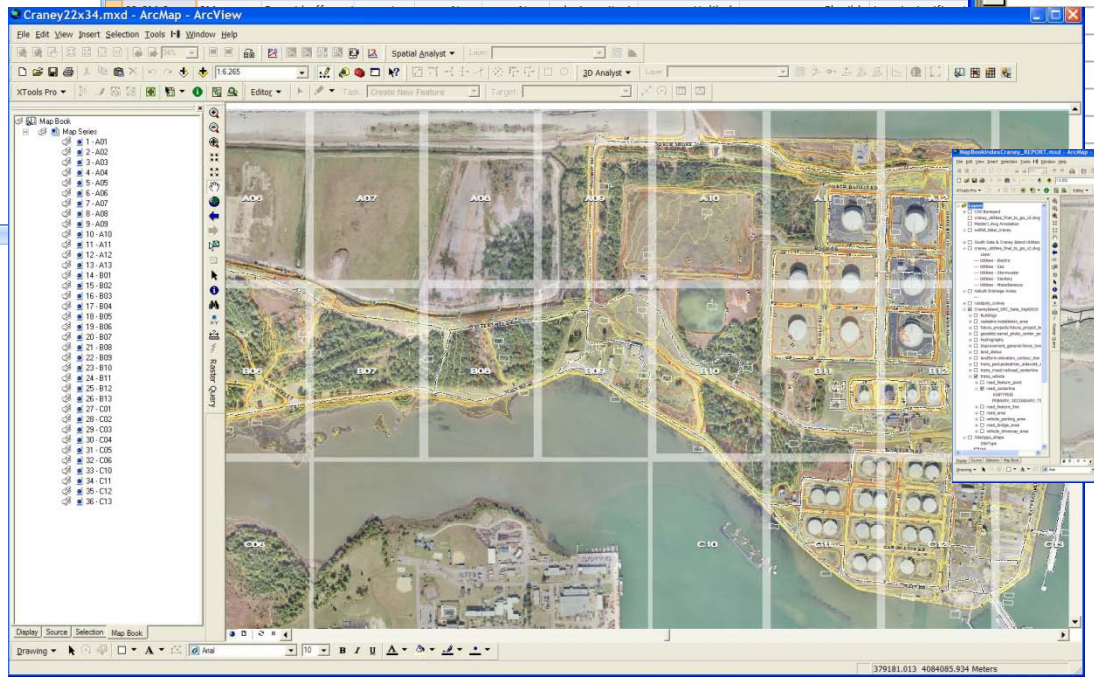
3. Data Development

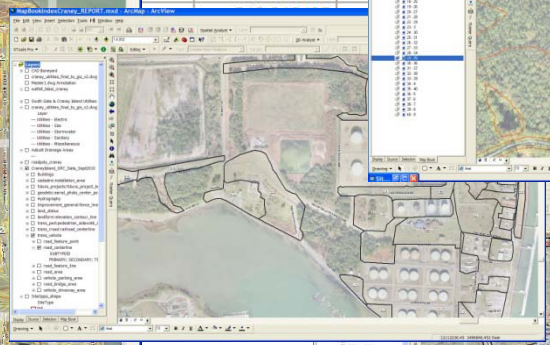
- **Pinning down the data…**

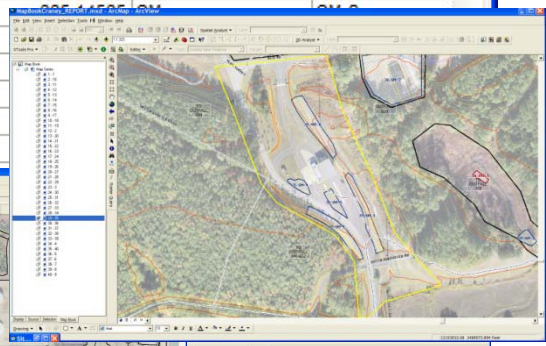
Attributes of SiteOpps_shape

ProjectID	SHAPE_Leng	SHAPE_Area	SiteType	Opp
01-SM-1	1111.793412	72746.618132	SM	SM-1
01-INF-1	161.972069	977.513594	INF	INF-1
02-SM-1	356.143317	6330.613303	SM	SM-1
02-SM-2	226.3488	3021.319571	SM	SM-2
02-SM-3	671.35952	7637.135404	SM	SM-3
02-SM-4	250.500859	3680.510452	SM	SM-4
02-SM-5	306.860711	5005.331955	SM	SM-5
02-SM-6	125.721835	486.294222	SM	SM-6
02-SM-7	949.36788	43630.835056	SM	SM-7
02-INF-1	127.825985	850.864559	INF	INF-1
02-INF-2	260.667632	1177.818009	INF	INF-2
03-SM-1	692.519233	24793.072384	SM	SM-1
03-SM-2	201.521081	2890.568487	SM	SM-2
03-SM-3	332.274607	6300.278431	SM	SM-3
04-SM-1	354.695062	1180.489383	SM	SM-1
04-SM-2	293.500298	975.621266	SM	SM-2
04-SM-3	87.055321	463.179157	SM	SM-3
04-SM-4	509.873708	11843.640944	SM	SM-4
05-SM-1	335.082001	1268.691748	SM	SM-1
05-SM-2	114.958286			
	394.416847			
	383.198225			
	540.632655			
	95.16055			
	99.158572			



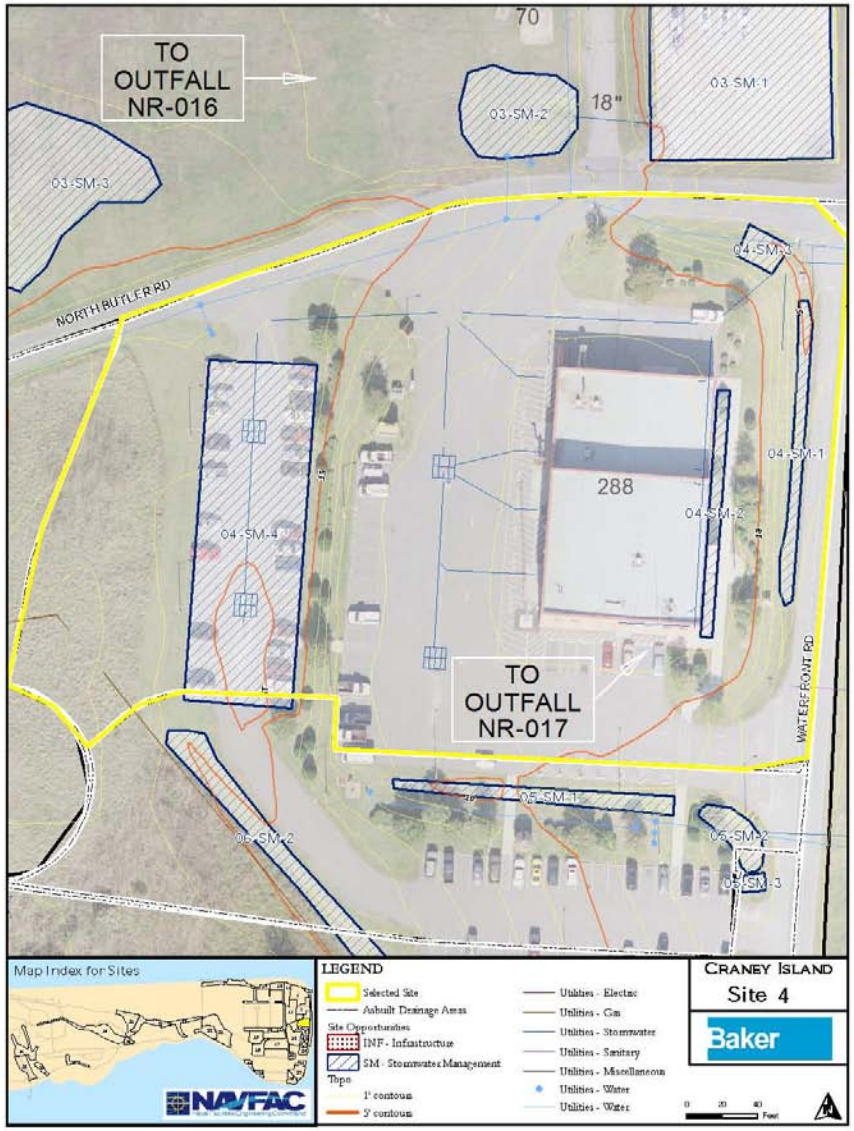






Case Study: Craney Island & Southgate Annex

4. Report Production (Primary Deliverable!)



Site 4

Opportunity:04-SM-1

Location: Engineering Building (Building 288) southwest of intersection of Waterfront Rd and North Butler Rd, the parking lot immediately south of the building, and both parking lots west of the building

Description: Upgrade the existing swale to provide stormwater benefits of a vegetated channel, wet swale also possible.

Cost Estimate: $20,500 **Rank:** 79

Opportunity:04-SM-2

Location: Engineering Building (Building 288) southwest of intersection of Waterfront Rd and North Butler Rd, the parking lot immediately south of the building, and both parking lots west of the building

Description: Downspout disconnection to tree box filter or rain garden, cistern also possible.

Cost Estimate: $10,900 **Rank:** 40

Opportunity:04-SM-3

Location: Engineering Building (Building 288) southwest of intersection of Waterfront Rd and North Butler Rd, the parking lot immediately south of the building, and both parking lots west of the building

Description: Install oil water separator to treat pollutants from vehicular traffic.

Cost Estimate: $75,000 **Rank:** 62

Opportunity:04-SM-4

Location: Engineering Building (Building 288) southwest of intersection of Waterfront Rd and North Butler Rd, the parking lot immediately south of the building, and both parking lots west of the building

Description: Remove parking and install permeable pavement. While possible, this is probably not a feasible solution given the relatively good condition of the existing surface.

Cost Estimate: $154,300 **Rank:** 34

Baker

Case Study: Craney Island & Southgate Annex

4. Report Production (Primary Deliverable!)

Southgate Annex Top 20 of 28 By Rank

ProjectID	Improvement	Cat1	Cat2	Cat3	Cat4	Fatal Flaw	Score	Rank	Rank	Cost
01-SM-1	Impervious cover conversion	32	50	12	14		108	1	1 / 28	$ 81,300
03-SM-1	Impervious cover conversion	22	50	20	14		106	2	2 / 28	$ 36,000
08-SM-1	Impervious cover conversion	22	50	20	14		106	2	2 / 28	$ 57,000
08-SM-2	Impervious cover conversion	22	50	20	14		106	2	2 / 28	$ 84,000
08-SM-5	Forest buffer establishment	32	30	23	20		105	5	5 / 28	$ 23,400
08-SM-4	Forest buffer establishment	27	30	23	20	Y	100	6	6 / 28	$ 27,000
08-SM-3	Forest buffer establishment	32	30	15	20		97	7	7 / 28	$ 36,800
06-SM-1	Infiltration (micro scale)	15	48	24	8		95	8	8 / 28	$ 43,500
04-SM-1	Dry swale (or bioretention if enough head)	35	33	14	11		93	9	9 / 28	$ 90,800
01-SM-2	Flow to open space/filter strip	32	30	12	14	Y	88	10	10 / 28	$ 78,000
05-SM-3	Wet swale	32	20	22	11		85	11	11 / 28	$ 75,300
07-SM-4	Soil ammendment and revegetated	22	20	25	17		84	12	12 / 28	$ 10,200
02-SM-2	Constructed wetland	37	20	12	14		83	13	13 / 28	$ 35,700
06-SM-2	Forest buffer establishment	15	28	20	20	Y	83	13	13 / 28	$ 23,400
01-SM-3	Wet swale	32	20	17	11		80	15	15 / 28	$ 70,500
02-SM-1	Wet swale	37	20	10	11		78	16	16 / 28	$ 96,200
03-SM-2	Wet swale	27	20	19	11		77	17	17 / 28	$ 50,300
05-SM-4	Forest buffer establishment	22	23	12	20	Y	77	17	17 / 28	$ 17,900
07-SM-1	Dry swale	22	30	14	11		77	17	17 / 28	$ 52,300
08-SM-6	Constructed wetland (or wetland restoration)	30	20	10	14		74	20	20 / 28	$ 117,800

Case Study: Craney Island & Southgate Annex

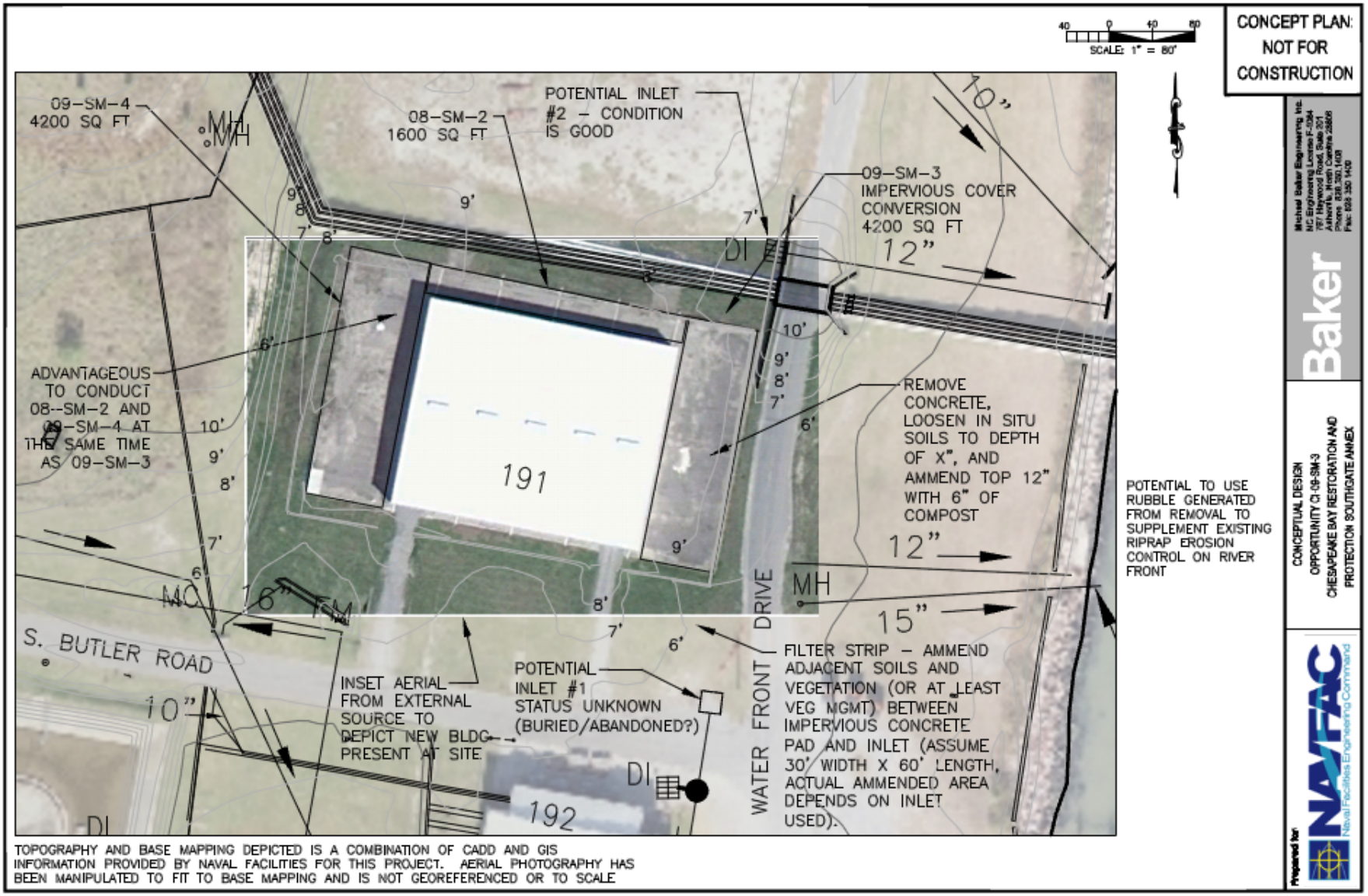
4. Report Production (Primary Deliverable!)

Craney Island Top 30 of 85 by Rank

ProjectID	Improvement	Cat1	Cat2	Cat3	Cat4	Fatal Flaw	Score	Rank	Cost
28-SM-1	Forest buffer establishment	22	28	22	20		92	1 / 85	$8,200
02-SM-7	Forest buffer establishment	17	28	25	20		90	2 / 85	$8,500
03-SM-1	Forest buffer establishment	22	30	17	20	Y	89	3 / 85	$13,100
22-SM-3	Forest buffer establishment	22	30	17	20		89	3 / 85	$11,400
09-SM-3	Concrete removal, Flow to open space, and/or soil amendment	22	30	22	14		88	5 / 85	$17,500
09-SM-4	Concrete removal, Flow to open space, and/or soil amendment	22	30	22	14		88	5 / 85	$30,000
16-SM-2	Forest buffer establishment	17	28	22	20	?	87	7 / 85	$9,400
28-SM-2	Forest buffer establishment	22	28	17	20		87	7 / 85	$14,700
02-SM-1	Flow to open space/filter strip	22	28	22	14		86	9 / 85	$29,400
02-SM-3	Flow to open space/filter strip	22	28	22	14		86	9 / 85	$31,900
02-SM-4	Flow to open space/filter strip	22	28	22	14		86	9 / 85	$24,500
22-SM-1	Flow to open space/filter strip	22	28	22	14		86	9 / 85	$23,500
22-SM-4	Flow to open space/filter strip	22	28	22	14		86	9 / 85	$22,400
01-SM-1	Forest buffer establishment	15	28	22	20	Y	85	14 / 85	$9,400
06-SM-3	Forest buffer establishment	15	28	22	20		85	14 / 85	$8,200
07-SM-3	Forest buffer establishment	15	28	22	20		85	14 / 85	$8,200
10-SM-2	Forest buffer establishment	15	28	22	20		85	14 / 85	$8,300
27-SM-5	Forest buffer establishment	15	28	22	20		85	14 / 85	$8,200
24-SM-1	Soil amendment	25	20	22	17		84	19 / 85	$5,000
03-SM-3	Forest buffer establishment	10	28	25	20		83	20 / 85	$7,800
37-SM-1	Forest buffer establishment	10	28	25	20		83	20 / 85	$8,000
09-SM-2	Flow to open space/filter strip	22	28	17	14		81	22 / 85	$26,500
22-SM-5	Flow to open space/filter strip	22	28	17	14		81	22 / 85	$21,500
27-SM-2	Flow to open space/filter strip	22	28	17	14		81	22 / 85	$31,500
35-SM-4	Bioretention	17	28	25	11		81	22 / 85	$25,500
27-SM-3	Forest buffer establishment	15	28	17	20		80	26 / 85	$9,400
02-SM-5	Flow to open space/filter strip w/ soil amendment	20	28	17	14		79	27 / 85	$29,400

Case Study: Craney Island & Southgate Annex

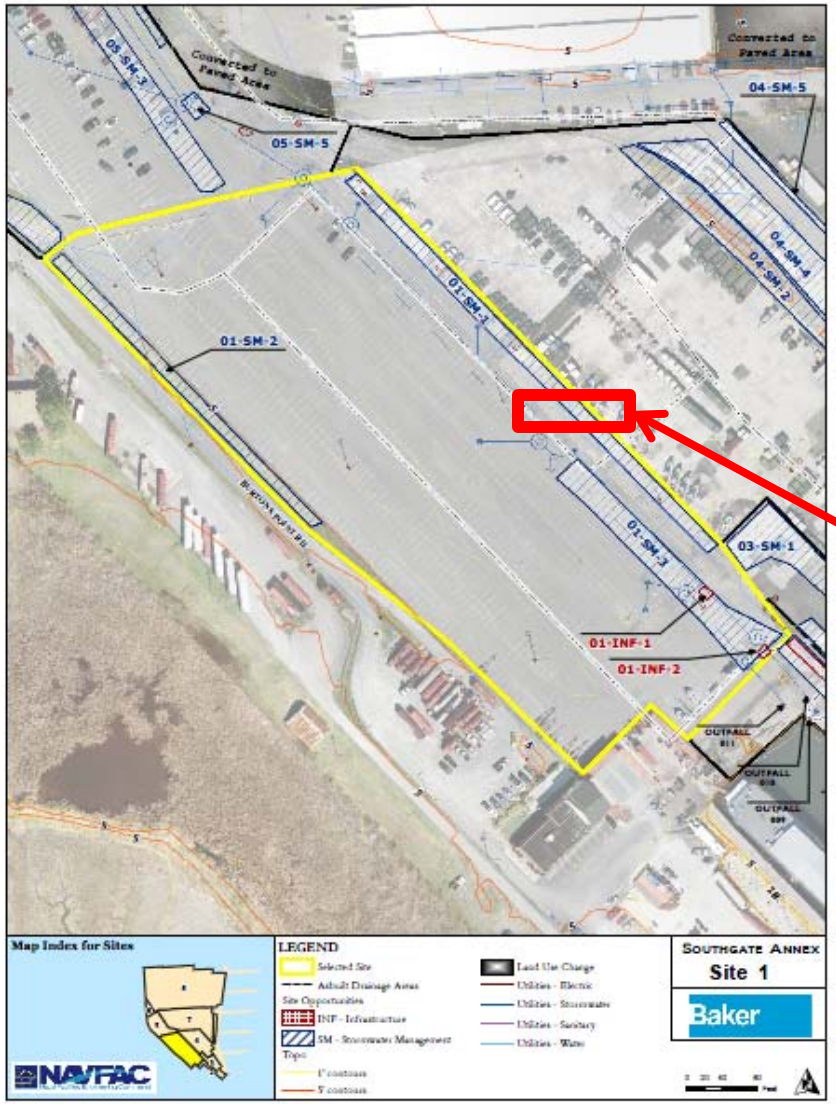
4. Concept Plans



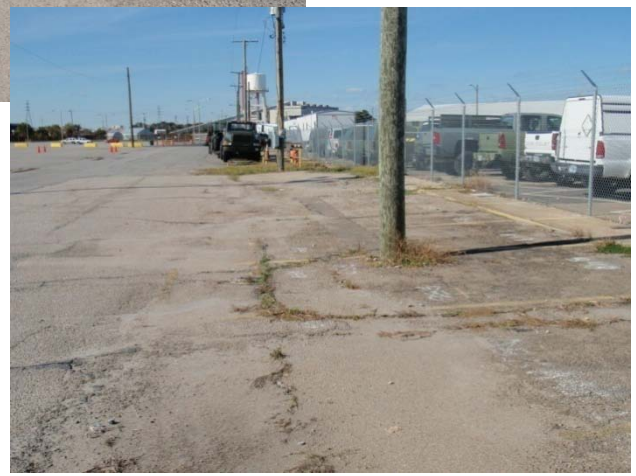
Southgate Annex - Top 5 Opportunities

Rank	Proj. ID	Improvement	Cost
1 / 28	01-SM-1	Impervious Cover Conversion	$ 81,300
2 / 28	03-SM-1	Impervious Cover Conversion	$ 36,000
2 / 28	08-SM-1	Impervious Cover Conversion	$ 57,000
2 / 28	08-SM-2	Impervious Cover Conversion	$ 84,000
5 / 28	08-SM-5	Forest Buffer Establishment	$ 23,400

Southgate Annex Select Results-Top 5 Opportunities



01-SM-1	Impervious Cover Conversion

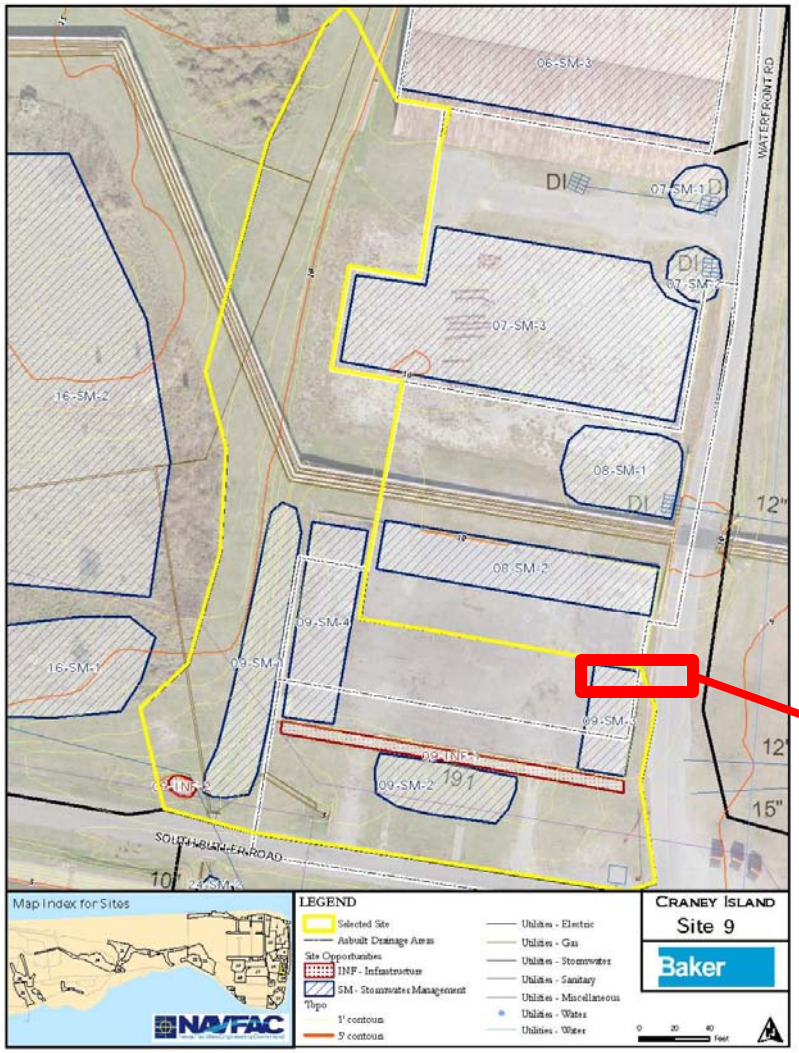


Site 1

Craney Island - Top 5 Opportunities

Rank	Proj. ID	Improvement	Cost
1 / 85	28-SM-1	Forest Buffer Establishment	$8,200
2 / 85	02-SM-7	Forest Buffer Establishment	$8,500
3 / 85	03-SM-1	Forest Buffer Establishment	$13,100
3 / 85	22-SM-3	Forest Buffer Establishment	$11,400
5 / 85	09-SM-3	Impervious Cover Conversion	$17,500

Craney Island Select Results- Top 5 Opportunities



Site 9

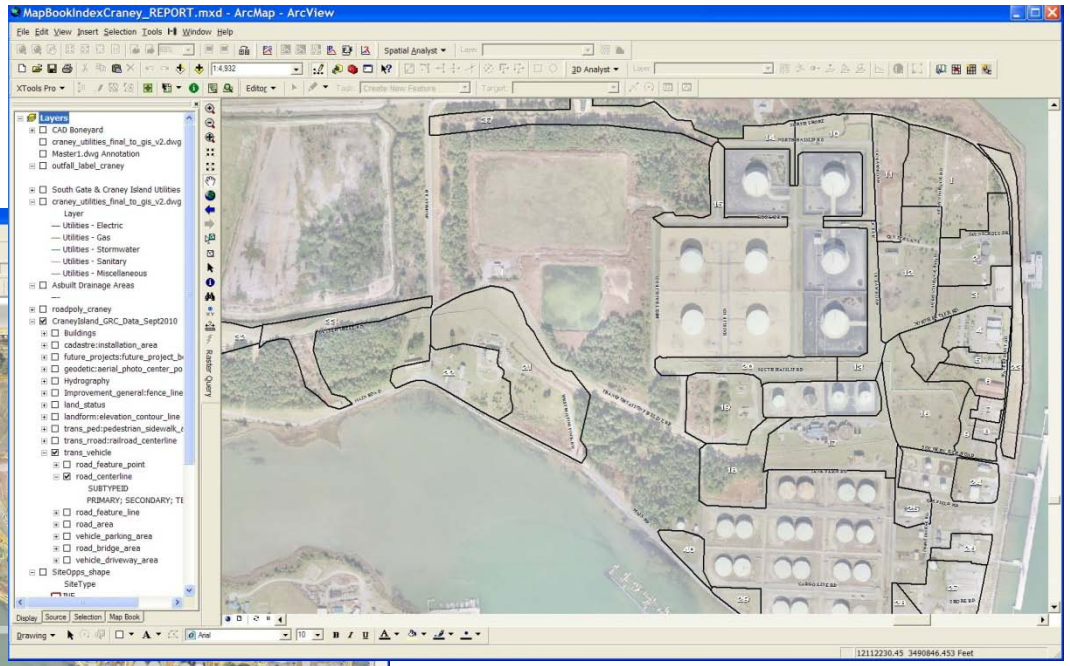
09-SM-3	Impervious Cover Conversion

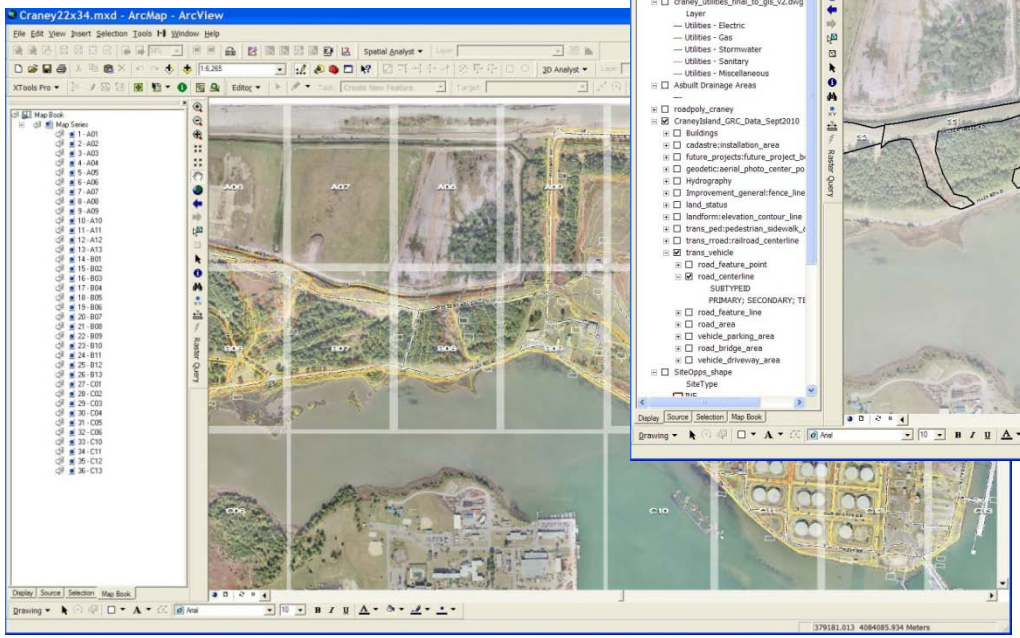
Project Highlights

- **Enhancements to the existing prioritization**
  - Favor sustainable approaches such LID
  - Incorporate water quantity reduction as a ranking element
  - Include consideration of habitat for aquatic and terrestrial resources
  - Incorporate the “cost” component of cost-effectiveness into the ranking
  - Development of “fatal flaw” concept to flag opportunities that should not be pursued

Project Highlights

- **Development and Automation of high quality opportunity information sheets**
  - Prioritization metrics
  - Photographs
  - and maps!





Project Highlights – Field Data Collection Automation

- **GEOLINK: Baker's GPS/GIS Data Collection System**
  - Take georeferenced photos
  - Sketch shape files
  - Input all "form" data – gets formatted
  - Directly into a database structure!!
  - Eliminates lengthy post processing
  - Eliminates errors
  - Still need paper forms!

Contacts

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Creating Value ...

... Delivering Solutions

Questions?

May 10, 2011

NAVFAC Naval Facilities Engineering Command

Baker